Leibniz-Institut für Meereswissenschaften **Date: 20.08.2008**
IFM-GEOMAR
KIEL, Germany

Cruise Report

Compiled by: Thomas J. Müller

F.S.Poseidon **Cruise No.: P359**

Dates of Cruise: from 12.10.2007 to 22.10.2007

Port of sailing: Texel, Netherlands

Port of berthing: Las Palmas de Gran Canaria, Spain

Port Calls: No

Areas of Research: technical test of underway systems and CTD

Institute: Leibniz-Institut für Meereswissenschaften, IFM-GEOMAR, Kiel, Germany

Principal Technician: Boris Kisjeloff

Number of Scientists: 2

Projects: Time series station KIEL276 in the Northeast Atlantic

Contents

1. Scientific crew

Name	Given name	Function	Institute
Kisjeloff	Boris	Principal technician	IFM-GEOMAR
Kleta	Henry	technician	DWD

IFM-GEOMAR Leibniz-Institut für Meereswissenschaften, Kiel
DWD Deutscher Wetterdienst (German Weather Service)

Scientist in charge and to contact:

Dr. Thomas J. Müller
Leibniz-Institut für Meereswissenschaften, Kiel
IFM-GEOMAR
Düsternbrooker Weg 20
24105 KIEL, Germany
+49-431-600-4161
+49-431-600-4152
tmueller@ifm-geomar.de
www.ifm-geomar.de

2. Research programme

The main objective of POSEIDON cruise P359 was to test underway measuring systems, in particular to

- to serve sensors of the automated meteorological station onboard
- to install a GPS compass sensor for the meteorological station
- to invent satellite data transfer of near surface temperature and salinity of the ship's thermosalinograph in near real time using the link of the meteorological station
- to take a test cast with a CTD when passing the long-term mooring site K276 at 33°N, 022°W

3. Narrative of cruise with technical details

12th October, 2007
11:06 UTC, sail from Texel, Netherlands

15th October, 2007
08:00, start test of new underway sensors and data acquisition software

20th October, 2007
06:59 UTC, CTD cast at 33°N, 022°W, maximum pressure 5314 dbar, sounding 5219 m (based on 1500 m/s average sound velocity)

22th October, 2007
14:42 UTC berth in Las Palmas, GC, Spain

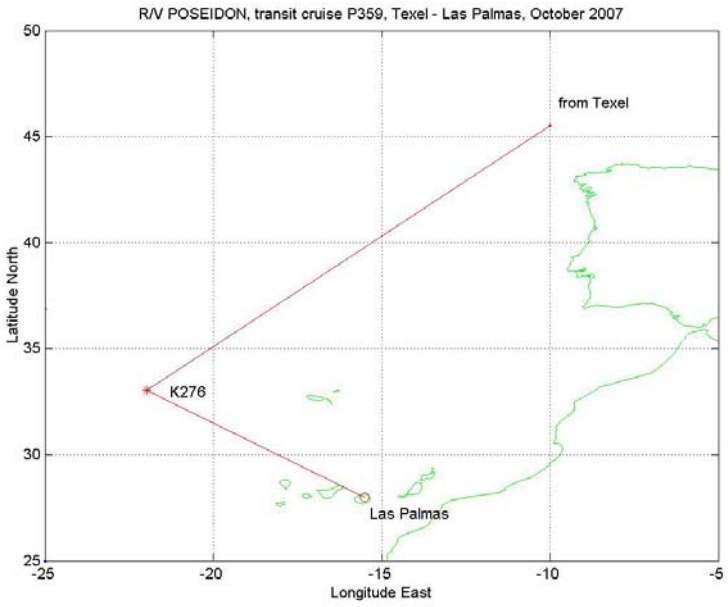

Fig. 3.1: POSEIDON cruise P359, *xxnd – xxth October, 2007, Texel - Las Palmas, cruise track with CTD station at mooring site K276*

4. Preliminary scientific results

testing cruise; no scientific data and analysis

5. Scientific equipment

5.1 Moorings

none

5.2 CTD/rosette

CTD
SBE 911 plus CTD from IFM-GEOMAR with internal ID SBE3.

Procedures
For procedures of calibration and processing see Müller (1999); formulas applied are according to UNESCO (1983).

CTD sensors according to data file
name 0 = prDM: Pressure, Digiquartz [db]
name 1 = t090C: Temperature [ITS-90, deg C]
name 2 = c0mS/cm: Conductivity [mS/cm]
name 3 = sal00: Salinity [PSU]
name 4 = sbeox0ML/L: Oxygen, SBE 43 [ml/l]
name 5 = t190C: Temperature, 2 [ITS-90, deg C]
name 6 = c1mS/cm: Conductivity, 2 [mS/cm]
name 7 = sal11: Salinity, 2 [PSU]
name 8 = sbeox1ML/L: Oxygen, SBE 43, 2 [ml/l]
name 9 = flag: 0.000e+00

Pressure sensor corresponds to IFM-GEOMAR internal ID SBE3,
last IFM-GEOMAR lab calibration March 2006

Calibration
- first step: manufacturer calibration for P, T1, T2, C1, C2, Ox1, Ox2.
- second step: for P sensor, IFM-GEOMAR calibration of March 2006 applied; order of 0 dbar correction at the surface, -4 dbar correction at 5000 dbar.
- bottle salinities taken during the cruise and measured 3 months later in January 2008 by ICCM in the deep sea (>2000 m) are too low by 0.007 when compared to Saunders.
- sensor lab comparisons show no significant differences for T and C and derived S and small but consistent differences for oxygen sensors:

sensor	median	std	unit	figure
Temp1 - Temp2	0.1	1.6	mK	t1_t2.jpeg
Cond1 - Cond2	0.15	1	•S/cm	c1_c2.jpeg
Sal1 - Sal2	0.0004	0.070	psu	sal1_sal2.jpeg
Oxy1 - Oxy2	-0.13	0.11	ml/l	oxy1_oxy2.jpeg
				oxy1_oxy2_2.jpeg

- Salinity calibration (Fig. 5.2.1):
CTD salinity with 1st sensor package is too low by 0.003 as compared to Saunders' relation in the deep sea; as 2nd package shows no significant differences, sensor package 1 is taken for the final cast with no corrections in T and C; only correction of S is indirect with P correction.

- Oxygen calibration (Fig. 5.2.1)
  comparison with historic data around 33°N, 022°W reveals that both sensors are low as compared to the historic data around K276. A 10 micromole/kg offset correction of sensor 2 fits the historic theta/oxygen relation (figure oxy1_oxy2_2.jpeg)

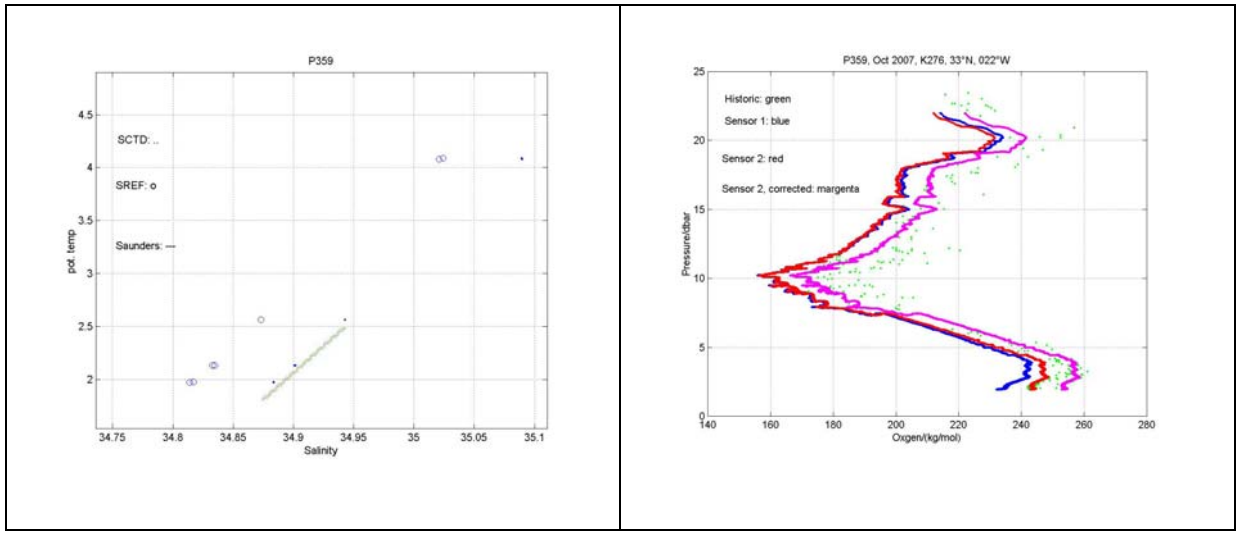

Fig.5.2.1*: calibration of CTD sensors: bottle salinity is far off Saunders' 1985 deep potential temperature/salinity relation (left panel); CTD salinity from sensor pair no. 1 is 0.003 high, but within 2xrms of Saunders' relation; no correction therefore. Oxygen from both sensors is low compared to historic bottle data from K276 (right panel, green dots); sensor no. 2 (red) corrected by 10 µmol/kg (margenta) matches the historic relation best..*

Processing

- DATCNV: convert binary data to CNV ascii file
  Output data, manufacturer's calibration:
  PRES, TEMP1, COND1, SAL1, OXY1, TEMP2, COND2, SAL2, OXY2, FLAG

- CTDOK.M with CTDOK_PAR1.M as parameter file
  the following processing is performed:
  the first cycle (often bad) is removed from the data set
  range check for P,T,C,Oxy, Fluo
  pressure deck offset determination and correction
  static pressure correction with pre-cruise calibration
  static stability check with allowed potential density difference 0.005 kg/l

- CTDOK.M with CTDOK_PAR2.M as parameter file
  remove part of up cast
  graphic editing
  maximal allowed downward probe velocity: 3 m/s
  despiking over 9 cycles median criterion with allowed differences:
  [P T1 C1 S1 Ox1 T2 C2 S2 Ox2 Flag time]
  diffs=[2 0.05 0.05 0.05 0 0 0 0 0 0 0];
  monotonizing w/r to P
  linear interpolation to 0.5 dbar

- CTDOK.M with CTDOK_PAR3.M as parameter file
  despiking over 9 cycles median criterion with allowed differences:
  [P T1 C1 S1 Ox1 T2 C2 S2 Ox2 Flag time]
  diffs=[0.5 0.005 0.005 0.005 0 0 0 0 0 0 0];
  moving average over 9 cycles (4.5 dbar)
  linear interpolation to 2 dbar

- Salinity: check with Saunders' relation: <0.003 high, ok

- Oxygen: change units § calibrate sensor 2; leave senor 1:
  load final_mat/p359
  convert to micro/kg using OXV2MOL.M
  check calibration with historic data around K276
  save final_mat(p359_003.mat

Conversion to ASCII
- CTDOK2RODB to convert P, TEMP1, SAL1, THETA1, OXY2 to RODB ascii format

5.4 Underway measurements

DATAVIS
A LINUX PC-based programme package, DATAVIS is used to log consecutively the data streams from navigational units, the ship's meteorological automated weather station, the deep sea echo sounder and from the thermosalinograph. Data are displayed on the bridge, in the dry lab and in the wet lab. Data are stored at 1 s intervals in hourly ASCII files on hard disk. This system was in a testing mode, and therefore no data exist to use scientifically.

Automated Weather Station
The station is operated and serviced on an annual basis by the German Weather Service (DWD). Sensors for wind direction and speed, air temperature, humidity, air pressure and water temperature are implemented. For the first time, a GPS compass sensor was successfully implemented and integrated into DATAVIS.

6. Acknowledgements
The ship’s master Michael Schneider and his crew efficiently supported and advised the science party during this test cruise.

7. Appendices

7.1 References

Müller, T.J., 1999: Determination of Salinity. *In: Methods of Seawater Analysis, Grasshoff, K., K. Kremling, M. Ehrhardt (editors)*, *Wiley, 600 pp*.

Saunders, P.M., 1986: The Accuracy of Measurement of Salinity, Oxygen and Temperature in the Deep Ocean, *Journ. Phys. Oceanogr.* ***16****, 1, 189-195*.

UNESCO, 1983: Algorithms for computation of fundamental properties of seawater, *UNESCO technical papers in marine science,* ***44***

7.2 R/V POSEIDON, 12.10.2007 - 20.10.2007, Texel - Las Palmas
Cruise -Log

Supervising Scientist Dr. T.J. Müller
Cruise POS 359, 12.10.2007-20.10.2007, Texel - Las Palmas
Station-Log

Acronyms
SBE3 : SeaBird CTD & oxygen sensor & fluorescence sensor
WD : sounding depth/m, 1500 m/s sound speed assumed
Pmax : for CTD max pressure/dbar, max depth/m else
SYM : symbol no. for plot

Status: 20.08.2008

Stat	Cast	Date	Time	LAT	LONG	WD	Pmax	Sym	remarks
	CTD	DD MM YYYY	hh mm	dd mm.mm	ddd mm.mm	m	dbar		
-9	-9	12 10 2007	11 06	53 03.00	004 27.00	-9	-9	2	Texel, sail
-9	-9	-9 -9 2007	-9 -9	45 30.00	-010 -00.00	-9	-9	4	WP2, Gulf of Bicaye
800	3	20 10 2007	06 59	33 00.00	-021 -59.01	5219	5314	1	CTD
-9	-9	22 10 2007	14 42	28 00.00	-015 -30.00	-9	-9	2	Las Palmas, call port